ANNUAL REPORT OF CHIEF ENGINEER

Tacoma, Washington.
January 7th, 1924.

To The Joint Commission,

Inter-County River Improvement,

Gentlemen:-

I have the honor to submit herewith my annual report for the year 1923, the expenditures for work performed being shown on the itemized budget schedule attached hereto.

At the Joint meeting held on March 10th, 1923 your Board instructed myself and Mr. R. H. Thomson to prepare a report and itemized budget for work to be performed during the year. This report and budget was submitted to and approved by the Board April 10th, 1923, and has been the basis upon which the seasons operations have been completed.

Subsequent to the adoption of this budget, however, after several consultations with Mr. Thomson and with members of the board it seemed advisable to make certain changes in the methods to be used in carrying out some portions of the work. Altho some of these changes constitute a radical departure from methods heretofore used on the River they were not hasty decisions but were developed over a period of months as the work progressed, utilizing such equipment as we had and new equipment purchased and it is hoped that by following the program adopted the expense for river clearing, bank protection and general maintenance will be very materially reduced.

The following gives a detailed analysis of work performed:-

MUCKLESHOOT SECTION.

Items 1 to 5 cover all of the work performed in this section.

Beginning at or above the drift barrier and working down stream to the County Line Section there has been a continual shifting of the main channel, resulting in the erosion of banks, undermining of large quantities of standing timber which later had to be removed at great expense from other portions of the river. It also resulted in new sources of heavy gravel which was brought down and deposited in the County Line Section.

Briefly the plan adopted in this portion of the river was to utilize a large part of drift in the constructions of retards for bank protection and for straightening the main channel of the river where possible. In addition to this practically all the standing timber on a strip thirty feet wide and approximately two miles long has been tied together and anchored with cables with the idea that if these banks are undermined the timber will automatically form bank protection and will at least not become drift. By this method we have taken care of all the work provided for under items 1 to 3. The work was done with the Fordson Tractor and Hoist, several thousand cords of drift being handled at comparatively low cost, special care being taken to place and cable large drift jams at the head of each of the three old Stuck River channels. At this date and during the eight foot rise of the river on December 7th and 8th all of the work has proved to be one hundred percent effective.

The work at the Drift Barrier, Item 5, consisted in the removal, piling and burning of many hundred cords of drift which had lodged immediately above the barrier, thereby providing an effective opening clear of drift approximately 600 feet wide, part of the lower cables having been removed to allow some of the earlier and smaller drift to find its way thro the barrier. In addition large boom logs were placed between each of the piers in the main channel for the purpose of stopping some of the larger drift. The attached photo shows this condition during the high water of December 7th.

Item 4. We decided that it was inadvisable to remove the jam above the mill at the Drift Barrier and the budget allowance provided under this item was expended in bank protection above the drift barrier and in the construction of a cable barrier at the mill.

AUBURN SECTION.

The crib dam provided for under Item 6 was constructed as a concrete pier and cable barrier and at very much lower cost than a timber crib dam might have been built and altho it has not been subjected to flood stages we expect that it will be a more permanent type of construction, it being the idea to develop this barrier by fastening to it such drift as may lodge on the bar in future years.

Item 7. The removal of drift below the Auburn Dam was completed by the old method of bucking, shooting and burning before we adopted the new method of clearing with the Fordson hoist and it therefore became necessary to build three brush retards above station 30, Item 8.

COUNTY LINE SECTION.

Item 9. Sixteen retards were built on the left bank above the Stewart Bridge. All of the bank protection in this section next year should be done with a Fordson Hoist using the drift available. The work under Item 9 was completed in November and during the freshets of December 8th and 20th the main channel broke over the bar and headed directly into the left bank between two of the newly constructed retards making it necessary to again put a crew on and take care of the emergency the additional cost of which was about $500.00

You probably realize that the condition in this Section is the result of annual deposits of large quantities of heavy gravel, and altho by preventative measures on the river above we hope to minimize this gravel flow, and by the construction of retards, etc., may be able to prevent serious erosion f of the banks for a year or two, it is nevertheless a problem that will ultimately require your consideration.

Mr. Thomson and myself have had many discussions on this subject. We are agreed, however, that a definate plan must be worked out for permanently taking care of the situation, which we expect to embody in a special report to be submitted to the Board sometime during the year.

DIERINGER SECTION.

Item 10, provided for 300 feet of bulkhead ½ mile below the Stewart Bridge at $20.00 per foot. This was changed to the construction and placing of hollow reinforced concrete piles and was very much in the nature of an experiment from the stand point of both cost and adaptability. The method finally adopted was to use the hoist which had been used for river clearing above the Auburn Dam, constructing leads on the front end and mounting the pump on the rear end of the skids. This made a very compact and mobile piece of equipment and altho some difficulty was experienced in jetting the piles where we struck a strata of gravel, nevertheless they were all driven to a

uniform line and penetration. They were then used as the foundation for bank protection consisting of brush, cable and wire mesh and has withstood the high water of December 7th with no erosion to the banks.

It is the opinion of both Mr. Thomson and myself that this type of bank protection will prove of advantage in certain locations on the river where gravel is not encountered and where concrete revetment seems to be of no permanent value. The attached photos shows these piles in course of construction and in place completed.

Three large retards were built against the type 5 concrete revetment on the right bank below the Stewart Bridge. This is at a bad curve and the toe-blocks were being badly undermined. The retards seem to have given good service during the recent high water, but for a distance of about ½ a mile the slab is in very doubtful condition and will require constant attention.

Under Items 11 and 12 the ten present retards above and below the spill way were built up and reinforced and two new retards built. They are all in good condition and there has been no further erosion of the banks.

Following the heavy storms in the latter part of November the concrete revetment on the left bank at the Zender place above Sumner was very badly undermined, caused mostly by surface water, and it therefore became necessary early in December to replace approximately 200 feet of the upper portion of the slab, constructing a ditch and over-flow gutters to take care of this surface water in the future. This emergency was rather unexpected and cost about $500.00 to repair.

ROESLI SECTION.

Item 13 is the replacement of an old wooden bulkhead below the Sumner Bridge with type 4 revetment, 500 feet, at an estimated cost of $5,500.00.

It was not expected that it would be necessary to lay a brush mattress on this job as many car loads of heavy rock had been dumped in behind the bulkhead and at the toe of the concrete revetment immediately under and below the bridge. Upon investigation however, we discovered that for a distance of over 400 feet this rock had almost entirely disappeared, there being from 10 to 14

feet of water at the toe of and undermining the existing slab and bulkhead.

The condition was finally taken care of by breaking over-board some of the old toe blocks and slabs, hauling several hundred yards of heavy gravel to build up toe, laying a very heavy brush mattress beginning at the bulkhead above the bridge and extending throughout the entire job. New concrete was then placed at the toe of the old work.

The new type four revetment which replaces the bulkhead was modified in design by using 5 inch instead of 4 inch slabs, carrying it over the berm with a 2 foot apron, reinforcing with wire mesh throughout and eliminating the wooden strip expansion joints. Many difficulties were encountered on this job owing to the proximity of a row of houses immediately on top of the bank and to the fact that this bulkhead had been used many years as a garbage dump for the city of Sumner.

One retard was built on the left bank below Sumner under Item 14. Five retards were built on the right bank at the confluence of the rivers, and together with the river clearing at this point were charged to Item 15.

There has been no further erosion here and with the completion of the type 4 revetment opposite the confluence, Item 18, which work was started March 1st, the banks seem to be in good condition to withstand the next flood.

Item 16 is the replacement of bulkhead No. 3 above the North Puyallup bridge. In order to maintain the alignment at this point it was necessary to make a gravel fill on which to place the concrete slab. Approximately ten thousand cubic yards was pulled across the stream from the bar opposite at a cost of about 35¢ per yard including the purchase price of a Fordson hoist used for doing the work. We encountered almost identical conditions on this work with those we found at the Sumner bridge, altho the depth of water and the loss of heavy rock fill did not extend so great a distance. The same methods of construction were adopted however, breaking over-board the old toe blocks on the existing revetment, laying a heavy mat throughout and using the same type

of reinforced concrete slabs. As this work neared completion, water and weather conditions being favorable, we decided to extend this revetment an additional 100 feet down stream to meet the next bulkhead. For the above reasons this item exceeded the estimate about One thousand dollars.

PUYALLUP SECTION.

No work of permanent nature was performed in this section. Our activities being confined to strengthening old bulkheads and the construction of ten retards on the Lacey tract above the Short Line bridge where the right bank had begun to cave very badly during the early freshet. It now seems to be in good condition.

MURPHY SECTION.

The work in this section has been confined to general maintenance and repairs.

RESERVATION SECTION.

The work in this section has been general maintenance and repairs and the construction of type 4 revetment between Stations 13 and 16. No difficulties were encountered except those due to the continual breaking down and inefficiency of the old concrete mixers used. The work was completed at a cost of less than $12000.00.

The outlet of the old river channel at the Aurzada place, Station 93, was closed with Cable and brush fence, with the idea of preventing further erosion and to build up the banks.

WEATHER CONDITIONS.

The total rainfall during the year 1923 was 32.31 inches, the normal rainfall being 45.41 inches. This deficiency, taking into consideration the fact that we have had already two Fall freshets, would indicate that we may look for no extreme floods during the winter.

We have established permanent high water gages at eight places on the river between Tacoma and the Auburn dam for the purpose of securing more definite data regarding stream flow at flood stages.

I desire at this time to express my appreciation for the advice and co-operation which has been given me by Mr. R. H. Thomson, Consulting Engineer, and would respectfully recommend that his services be again retained.

FINANCIAL STATEMENT.

The latest financial statements of the two Counties show the following fund balances:-

Pierce County.....November 30th, 1923.....$10,733.79

King County.....November 30th, 1923..... 15,778.81

$26,512.60

Respectfully Submitted,

H. F. GRONEN,
Chief Engineer.

HFG.MT.

The following new equipment was purchased during the year the cost of which has been charged to the particular jobs on which it was used as follows:-

One Fordson Tractor and Hoist.....	$ 1,454.00
One Fordson Tractor and hoist with caterpillar Tread.....	1,967.60
One Ford Roadster.....	370.44
Shop Equipment.....	145.00
Two electric boring outfits.....	448.75
~~1-4X6" - Duplex pump~~	
2-Koehring Concrete mixer.....	1,906.85
Forms and other equipment for making and driving concrete piles.....	400.00
Total equipment purchased.....	$ ~~4,785.79~~

6 62.64

Expenditures for month of December, 1923.

Budget items approved by Joint Board Meeting held in Tacoma, 4/10/1923.

ITEMS --	AMOUNT ALLOWED	TOTAL EXPENDED PREVIOUS MONTHS	EXPENDED CURRENT MONTH	TOTAL	REMARKS.
1	$2,400.00	$2,378.38	.....	$2,378.38	...Completed
2	1,650.00	1,239.30	.....	1,239.30	"
3	750.00	735.00	.....	735.00	"
4	800.00	698.75	.....	698.75	"
5	10,000.00	9,982.57	.....	9,982.57	"
6	7,500.00	4,446.44	.....	4,446.44	"
7	5,000.00	4,349.50	.....	4,349.50	"
8	600.00	744.46	.....	744.46	"
9	2,800.00	2,493.32	.....	2,493.32	"
10	6,000.00	5,663.24	.....	5,663.24	"
11	500.00	41.28	.....	41.28	"
12	150.00	.....	.....	.....	
13	5,500.00	7,493.43	.....	7,493.43	"
14	150.00	179.12	.....	179.12	"
15	1,000.00	744.75	.....	744.75	"
16	8,000.00	8,856.21	.....	8,856.21	"
17	14,400.00	11,394.67	$ 60.78	11,455.45	"
18	2,500.00	2,084.26	.....	2,084.26	"
19	9,000.00	7,790.99	.....	7,790.99	"
20	10,000.00	5,630.39	$2,594.12	8,224.51	"
21	7,500.00	6,651.18	785.00	7,436.18	"
22	14,674.92	14,674.92	.....	14,674.92	"
	$110,874.92	$98,272.16	$3,439.90	$101,712.06	

$98,272.16
3,493.90
$101,712.06

MT.

H. F. GRONEN,
Chief Engineer.